



Global Monitoring Plan on Persistent Organic Pollutants

Passive Sampling of Ambient Air Methodology and Procedure

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Procedure for Air Monitoring using Passive Air Samplers (PAS)

1 INTRODUCTION

This procedure has been elaborated to provide support for the Global Monitoring Plan (GMP) on Persistent Organic Pollutants (POPs) under the Stockholm Convention. The programme includes the participating countries in Africa, Asia, Latin America and the Caribbean and Pacific Islands in the projects financed by the Global Environment Facility (GEF).

The objective of this procedure is to describe the management of air passive samplers (PAS) for sampling pollutants, including the main steps for assembling and disassembling, as well as maintenance of the passive air samplers. This procedure is applicable for the deployment of PAS in urban, suburban, rural and remote areas.

The persistent organic pollutants that are considered to be sampled with PAS are:

Basic POPs (aldrin, dieldrin, endrin, cis-chlordane, trans-chlordane, cis-nonachlor, trans-nonachlor, oxychlordane, heptachlor, cis-heptachlor epoxide, trans-heptachlor epoxide, *p,p'*-DDT, *o,p'*-DDT, *p,p'*-DDE, *o,p'*-DDE, *p,p'*-DDD, *o,p'*-DDD, mirex, hexachlorobenzene, toxaphene), polychlorinated dibenzo-p-dioxins (PCDDs), polychlorinated dibenzofurans (PCDFs) and polychlorinated biphenyls (PCBs).

The same procedure also applies to the sampling of the nine POPs listed by the Conference of the Parties at its fourth session: Lindane (γ -HCH), α -HCH, β -HCH, polybrominated diphenyl ethers (PBDEs), hexabromobiphenyl (PBB), chlordecone, pentachlorobenzene, perfluorooctane sulfonic acid, its salt and perfluorooctane sulfonyl fluoride; at its fifth session: endosulfan; at its sixth session: hexabromo cyclodecane (HBCD).

2 MATERIALS, PAS ASSEMBLING AND DISASSEMBLING

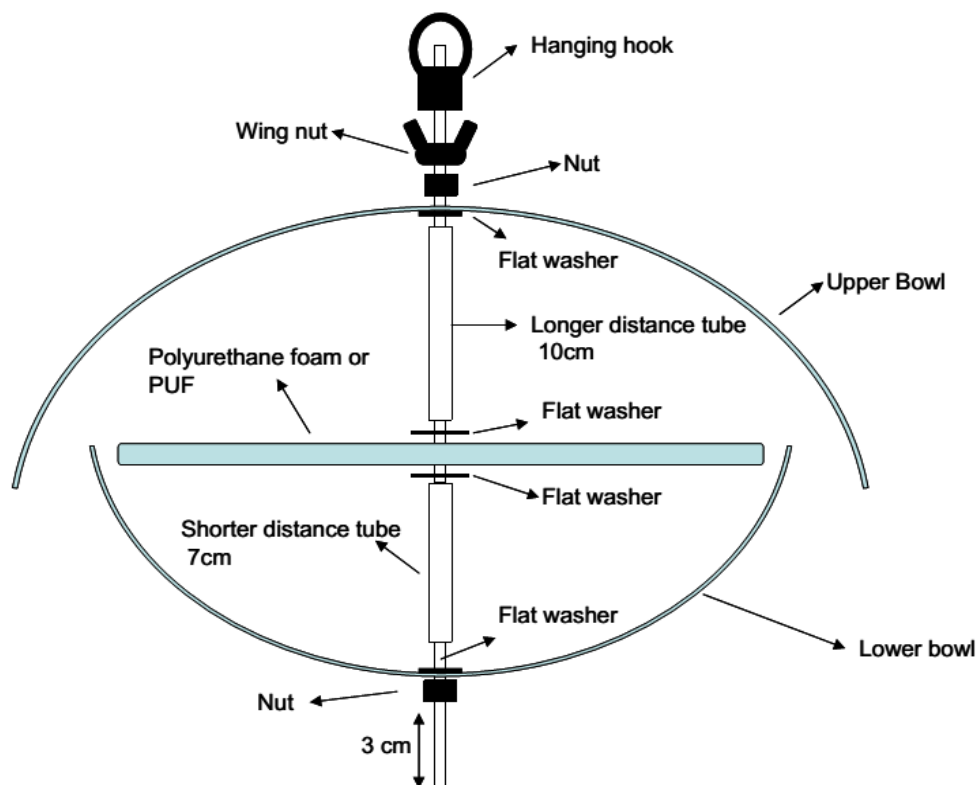
2.1 MATERIALS

List of parts that make up the passive air sampler:

- Upper and lower bowl: upper bowl is bigger than lower bowl
- Thread axis: one.
- Distance tubes: one short (7cm) and one large (10cm)
- Flat washers: four
- Nuts: two
- Wing nut: one
- Hanging hook: one
- Hook adaptor: one



Scheme showing the different parts of the PAS and the way to assemble them:



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2.2 PAS ASSEMBLING

The PAS should be assembled from the bottom to the top. The following steps describe the way to assemble the passive air sampler:

1. Place the axis in vertical position. At 3 cm of the end of the axis screw a nut. This nut will be the bottom limit.

Subsequently, the assembly process starts, adding the different parts at the top of the shaft to complete the assembly.

2. Above the bottom limit nut place the lower bowl, put a flat washer, the shorter distance tube and finally another flat washer.

3. Incorporation of the polyurethane foam (PUF) disk:

- The foam must have a small central hole. The hole can be made with two tweezers with the tips wrapped in aluminium foil.

- Place the foam into the axis with the help of the tweezers or with your own hands but using aluminium foil to hold the disk, so that NEVER foam can be touch with the hands directly, until to let the foam above de flat washer.

- Place another flat washer onto the PUF. This step ensures that the PUF disk will stay in the right position during the whole sampling period.

4. Put the longer distance tube followed by a flat washer and finally place the upper bowl. Screw a second nut to close the sampler and place the wing nut. This part keeps the PAS closed.

5. PAS deployment: Screw on the top of the axis the hook adaptor and the hanging hook. This step allows the installation and position of the PAS in the sampling structure. Make sure that the sampler is strongly placed and avoid falls of the PAS. The hanging hook is an optional part; its use depends on the final location structure. In any case, the PAS must always remain vertical, with the (largest) bowl above, throughout the collection, as shown in the picture below:

6. Identify the PAS with the following data of the sampling:

- a) Location
- b) Sampler identification code (See 2.5)
- c) Date of the beginning of sampling
- e) Date of the ending of sampling
- f) Type of compounds to be analyzed

7. Write down and report all data of the sampling (attached MsExcel file, See 6), as well as any observation.

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IMPORTANT: during the assembly and disassembly of the PAS, analyst must wear protection gloves.



2.3 ADDITIONAL MATERIALS

Additional material for the sampling is needed:

- Polyurethane foam disk, conveniently conditioning (See 2.4)
- Aluminium Foil
- Tweezers: Two
- Cutter or scissors
- Extensible closure plastic sheet to seal
- Latex gloves or equivalent
- Acetone and/or ethanol to clean parts of the sampler
- Waste bag
- Water-proof pen
- Notebook to record the data and incidents of sampling

2.4 CLEANING AND CONDITIONING OF POLYURETHANE FOAMS (PUFS)

The polyurethane foam disks (PUFs) can contain undesired compounds coming from the manufacture process or the storage. The aim of cleaning and conditioning is to eliminate these compounds and to have the absorbent in suitable conditions for sampling.

IMPORTANT: The clearing/conditioning procedure will be carried out by the reference laboratory before the shipment of the PUFs to each country for the sampling.

Cleaning/conditioning of polyurethane foam:

- 1.- Introduce the foam in a beaker and add 2000 ml ultrapure water so that it remain covered. Squeeze the foam to make sure it is completely wet. Add more ultra pure water in the case of not being totally submerged. This process may include the simultaneous cleaning of several foams.
- 2.- Place the beaker in an ultrasonic bath for 15 minutes.
- 3.- Throw out water and repeat steps 1 and 2 one more time.
- 4.- Drain the foam and place it in a Soxhlet to perform an extraction with acetone (quality for organic trace analysis) for 24h.
- 5.- After Soxhlet extraction, remove the excess of acetone in the polyurethane foam and proceed to make a second extraction, with a different solvent, but during the same time and under the same conditions applied for extraction with acetone. The solvent used in the second extraction depends of the compounds intended to capture and analyze in the foam:

- Dichloromethane, for the collection and analysis of basic POPs or the 6 indicators PCBs.
- Toluene, for the collection and analysis of dioxins and dioxin-like POPs, as well as for the case of brominated compounds (PBDEs, HBCD and HxBBB)
- Methanol, for the collection and analysis of fluorinated compounds (PFOS)

- 6.- After the second extraction, remove the excess of solvent from the polyurethane, first manually and afterwards placing the foam in a desiccator under vacuum. The process finished when the foam is completely dry.
- 7.- Once dried, preserve the foam from light by wrapping it in aluminium foil.
- 8.- Label with cleaning date and expiry date and keep in a preserved place from light until use.

NOTE: Foams are of SINGLE use. Once used in a sampling can not be reused, recovered or recycled.

2.5 IDENTIFICATION OF SAMPLERS AND PUFs

In order to properly identify the samplers and PUFs, a UN Environment code has been defined consisting of a set of letters and numbers that will unequivocally identify: the country where samplers are installed, the sampling year, as well as the number of campaign within that year, and the compounds to be determined. The samplers will be identified in the two bowls with the corresponding code.

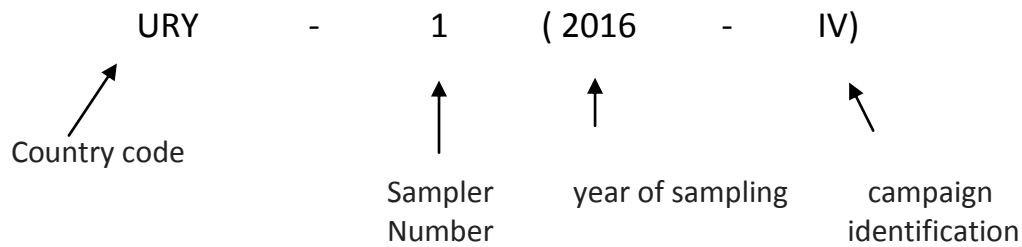
In this sense, a UN Environment code is always composed of: a first set of three letters that make reference to the country, followed by a hyphen and a number of sampler (related to the compounds to be determined), and followed, in parentheses, of the



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sampling year four digits) together with the number of campaign in Roman numerals.

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An example of identification code would be:



The first set of three letters corresponds to the country's abbreviation according to ISO code used by UN.

(See Table 1 and <http://unstats.un.org/unsd/methods/m49/m49alpha.htm>)

The number after the hyphen corresponds to the coding of the different samplers to be installed and is related to the type of analysis to be performed and the laboratory responsible for conducting the analysis. (See Table 2)

The number written in Roman numerals after the year of sampling will identify each of the campaigns to be conducted within one year. (See Table 3)

Table 1: ISO code for the identification of the country. The first set of three letters of the sample code.

Africa:

COUNTRY	COUNTRY CODE
Democratic Republic of Congo	COG
Egypt	EGY
Ethiopia	ETH
Ghana	GHA

预览已结束，完整报告链接和二维码如下：

https://www.yunbaogao.cn/report/index/report?reportId=5_14686

